

1

PRACTICAL REMARKS

ON SOME POINTS IN

THE PHYSICAL DIAGNOSIS

OF

PHTHISIS PULMONALIS.

BY

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PRACTICAL REMARKS, ETC.

THERE are still some points with regard to the physical diagnosis of phthisis pulmonalis which require elucidation, and the following remarks are intended to direct the attention of my medical brethren to a few facts which may assist them in their attempts at forming correct conclusions under difficult circumstances.

I. Diagnostic Importance of Bronchitic Signs as preceding and masking Tubercular Disease of the Lungs.

The relation of Bronchitis to Phthisis Pulmonalis has necessarily engaged the attention of all those who have had much experience in treating those affections. The term "Bronchial Phthisis" (however vaguely employed), is in itself sufficient evidence of this, and serves to express a condition in which, with all the usual signs and symptoms of phthisis, those significative of bronchitis are always present to a great degree. But there never can be a case of phthisis without, at the same time, more or less lesion of the bronchi, and the super-vention of bronchitis and emphysema on the tubercular disease is so very general as to require no comment. The cases which, in practice, are so difficult, especially in a diagnostic point of view, are those where bronchitis ushers in phthisis, and serves to mask the tubercular disease. The difficulty sometimes experienced in these cases may be best illustrated by a few examples.

CASE I.—I was consulted in the case of a young lady, æt.

eleven years, in the year 1845. She had a short time previously recovered from a violent and prolonged attack of whooping-cough, and when I first saw her, complained of dry cough, and occasional difficulty of respiration. On percussion, the chest, on both sides, presented its normal resonance. On auscultation, there was slight harshness of the inspiratory, and trifling prolongation of the expiratory murmur, very general over both sides anteriorly, but especially on the right side, with occasional sibilation. No increase of the vocal resonance anywhere. The patient was a well grown girl, and had no other complaint or functional disorder, and the conclusion, of course, was bronchitis, with slight emphysema, following whooping-cough. This bronchitis, however, continued, the cough and occasional dyspnoea being sometimes very urgent. When eighteen or nineteen years of age, the latter symptom sometimes attacked her when dancing, an exercise of which she was very fond, and obliged her to desist. In the autumn of 1853, expectoration of purulent mucus commenced, and the appetite began to fail, circumstances which excited my apprehensions, although nothing was to be heard but sibilation and prolonged expiration; percussion being everywhere clear. The most anxious care was now taken, by means of good diet and exercise, to support the general strength, and with such success that there was no emaciation, and little falling off in her bodily powers. In the spring of 1854, however, hemoptysis commenced, at first slight, but subsequently more abundant, especially at the periods of menstruation. Now commenced, also, languor, weakness, dyspeptic symptoms, palor of countenance, night perspirations, and other signs of debility, which gradually increased, notwithstanding the use of cod liver oil and every conceivable means of support. All this time, although it was evident to me that she was consumptive, the most careful examination could elicit nothing but the physical signs formerly noticed, with the addition of occasional sonorous râle posteriorly and inferiorly, mingled with occasional mucous râle. Misty, foggy weather invariably added to her sufferings, while clear, dry weather, notwithstanding the cold, served to revive her. On the approach of winter in 1854, Dr Christison saw her with me, and confirmed the results previously arrived at from physical examination of the chest, and it was then resolved that she should spend some months at Clifton. During the journey she had a severe attack of hemoptysis, and this symptom prevented her going out for some

time. Notwithstanding the assiduous professional care of Dr Symonds, the disease progressed, and she died the very day of her return to Edinburgh.

On examining the lungs, there was found great emphysema anteriorly on both sides, and considerable engorgement posteriorly and inferiorly. The middle and inferior lobes on the right side were hepatized from chronic pneumonia, and the upper lobes on both sides, but more especially on the right, contained circular patches of miliary tubercle, about three-fourths of an inch in diameter, irregularly scattered through the pulmonary tissue, communicating to it when pressed on externally, a nodular character. Between these isolated patches the lung was, with the exceptions just noticed, quite healthy.

In this case, which I occasionally saw during a period of ten years, I am satisfied that the ordinary physical signs of phthisis never were present. There was never dulness on percussion, or any indications of softening or of a cavity, and the *post-mortem* examination betrayed a condition of the lungs which proved that the signs of bronchitis and emphysema, which had been present throughout her illness, were true indications of what really existed. The pneumonia, the more immediate effects of which caused death, was of comparatively recent occurrence, and the time of tubercular deposition cannot be fixed with certitude, although, judging from the symptoms, I am inclined to consider that it dated from the spring of 1854. Here then we have chronic bronchitis and emphysema, terminating in phthisis, without any physical sign being manifested indicative of the latter lesion throughout the whole course of the disease.

CASE II.—On the 29th of November 1854, I saw a gentleman, æt. 57, in consultation with Dr Mercer Adam of Dumfries, who was labouring under chronic laryngitis. He was anxious about his voice, which was of great importance to him, and complained of a troublesome flow of saliva, which had been excited some months previously by a very mild mercurial course. He could only speak in a hoarse whisper. There was frequent, abrupt, barking cough, accompanied by a copious, watery frothy mucus, which he declared came from the mouth. Deglutition was difficult, and accompanied by some pain. Appetite capricious; pulse between 60 and 70, of moderate strength; general aspect sallow, and indicative of chronic disease. On percussing the chest, it was everywhere resonant an-

teriorly, and equal on both sides. On auscultation, the respiratory murmurs anteriorly were feeble, of equal length, the expiration here and there prolonged, with harshness of inspiration, but no other morbid sound. From the absence of voice, no change in the vocal resonance could be judged of, but cough elicited nothing unusual on either side. Posteriorly the dulness appeared somewhat increased, but equal on both sides, and neither respiration nor cough gave any evidence of disease, further than diminution of respiratory capacity, which was attributed to the obstruction existing in the larynx, with probable collapse of the lungs behind. The treatment was directed to supporting nutrition by means of good diet and cod-liver oil, and a sponge saturated with a solution of nitrate of silver, of the strength of ʒij. to ʒj. of water was applied to the pharynx, epiglottis, and glottis, every other day. This treatment, persevered in till the end of December, was productive of no benefit, and the troublesome flow of saliva continuing, opium, in grain doses, was given at night to check the secretion. Two or three grains of the drug, in grain doses, at intervals of six hours, succeeded in arresting the salivary secretion, for a period varying in extent from one to three days. At length, the opium seemed to cause unpleasant dryness of the mouth, and it was observable that the appetite had much diminished since its employment, while the general strength was correspondingly lessened. During all this time I frequently examined his chest, which always presented the same signs as when I first saw him; and Dr Christison, who, on one occasion, examined his chest with me, also failed to detect any positive evidence of pulmonary tubercular disease. Towards the end of January, as it became apparent that no improvement was likely to be effected, he returned home. From this time emaciation progressed, notwithstanding the administration of the most nutritive substances. Deglutition was painful and difficult; the mouth dry, for which chewing pyrethrum root, and other remedies, were employed without avail. The expectoration increased and became more purulent, the pulse mounted to 120, he could swallow nothing, and died February 26, 1855.

The *post-mortem* examination was conducted by Drs W. A. T. Browne and Mercer Adam, the latter of whom was so good as to inform me that "the mucous membrane of the larynx was found to be considerably hypertrophied. It presented no ulceration, or traces of ulceration, and its colour and appearance were nearly normal. Both lungs were extensively interspersed with tubercles, which were

of all sizes, from that of a millet-seed to that of a boy's marble. These last were isolated tubercles—not aggregated masses—ends of which could be scooped out of its investing membrane. But, besides all this, certain portions of the parenchyma of the lung were completely infiltrated with the tuberculous deposit, so that they resembled the dense hepatizations of pneumonia. At the apex of the left lung, there was a cavity the size of a pullet's egg, which was empty and dry. One or two smaller cavities were found in the right lung. Both lungs were very emphysematous."

In this case also, frequent examination of the chest convinced me, as it did Drs Browne and Mercer Adam of Dumfries, that none of the ordinary signs of phthisis pulmonalis were present. The *post-mortem* examination, however, revealed far more extensive tubercular deposition in this than in the former case, which, notwithstanding, was masked by the emphysema, and the diminished breathing from constriction at the larynx. Had the voice been perfect, it is probable that increased vocal resonance might have assisted our diagnosis; but, certain it is, that, notwithstanding every pains were taken, there was no physical signs to warrant our suspicion of the existence of phthisis.

In the following case, the bronchial signs, with consumptive symptoms, were present throughout; and I have no doubt tubercular deposition existed. In this instance, however, an arrestment of the latter was brought about, with recovery:—

CASE III.—Margaret M'Kenna, æt. 27, a worker in the fields, was admitted into the clinical ward of the Royal Infirmary, April 25, 1854. She stated, that six months previously, after exposure to cold and wet, she was seized with cough and expectoration, which had continued ever since. She admitted that there had been dry barking cough for a long time, and that, three years ago, she spat blood. For some months past, the appetite had been much impaired, and there had been diaphoresis at night. On admission, she presented a very emaciated appearance. The pulse was 112 weak, with a soft blowing murmur, synchronous with the systolic sound at the base of the heart. Catamenia suppressed, appetite abolished, and a sense of load in the stomach, after taking food; headache, and a sensation of great weakness, which prevented her walking. On

percussing the chest, no appreciable dulness was to be detected anywhere, the sound being clear and equal on both sides. On auscultation, with the exception of slight harshness with the inspiration, no morbid sign whatever could be discovered, either anteriorly or posteriorly; cough, however, was troublesome, attended with a tolerably copious muco-purulent expectoration. No sore throat, or alteration of the character of the voice. Under the use of cod-liver oil, and nutritive diet, with wine, her strength gradually improved. The appetite, however, continued to be impaired; and the diaphoresis at night, cough and expectoration continued. By the end of May, although the symptoms continued, her strength was so far improved that she could get up, and walk about the ward. A careful examination, on the 14th of June, again satisfied me and the clinical class, that none of the physical signs of phthisis were present, although the impairment of appetite, sweating, and extreme emaciation, continued. The cough and expectoration, however, were much less, and her diet was carefully regulated, so as to be as nutritious as possible, without overloading the stomach. She had 3vj. of wine daily. She continued to improve very gradually; and the report on the 13th of November is, "Percussion good and equal over the whole chest, except over second intercostal space on left side, where there is a marked resonance when compared to the other parts of the chest. Over this place, and between it and left clavicle, the inspiration is very harsh, but the expectoration is not increased; here also, the vocal resonance is somewhat increased. Over the rest of the chest, inspiration somewhat harsh, but equal. Blowing cardiac murmur still continues; pulse 80, soft and regular. Still weak, with perspiration at night, and disinclination for food. There is harshness of the voice." The laryngeal hoarseness continued throughout December, but disappeared under the use of topical applications of a solution of nitrate of silver, with a sponge. She continued to present all the symptoms and general appearance of phthisis, the cough and expectoration being better and worse alternately, and her general strength being now greater, then less. In February and April 1855, the feet became œdematous, and the urine albuminous, symptoms which disappeared under the action of diuretics. In May and June, there was considerable improvement. Gradually the expectoration and cough entirely ceased, the sweatings disappeared; she walked about perfectly well, though still

looking thin, but at length her strength became good, and her general appearance and *embonpoint* greatly improved. On the 1st of July, I examined her chest with great care. There was positively nothing abnormal now to be discovered on percussion or auscultation, either anteriorly or posteriorly, with the exception of the slightest inspiratory harshness, and perhaps trifling increase of the vocal resonance under the left clavicle. She was then dismissed.

On considering all the circumstances of this case, I cannot but form the opinion, that notwithstanding the absence of any marked signs of phthisis pulmonalis, this woman still laboured under that disease. I would explain the slight indications which presented themselves, as being indicative of bronchial lesion, with perhaps trifling adhesion and condensation at the apex of the left lung, whilst a more scattered tubercular deposition, undistinguishable by percussion or auscultation, gave origin to the permanent cough and expectoration. In this, as in the two former cases, all the symptoms were those of phthisis; and I ascribe the arrestment and subsequent recovery, in no small measure, to the readiness with which cod-liver oil, and nutrients were taken, and the perseverance with which they were continued for nearly fifteen months.

From a consideration of the constant signs of bronchitis, and the frequency of emphysema as an accompaniment of phthisis, it must be evident that some cases are very likely to occur where the physical signs of the two former are likely to mask those of the latter. Especially, it is probable, that conditions of the lungs may exist, in which the augmented sonoriety of emphysema will so counterbalance the increased dulness of tubercular deposition, that the resulting note, on percussion, may assume a medium character, and thereby approach that of health. Whether such be the true explanation of the absence of positive signs, on percussion, in the foregoing cases, I will not pretend to say; but, in the absence of a more positive theory, I offer it as the most satisfactory that occurs to me.

Numerous other comments might be made regarding the relation of pulmonary tubercle to bronchitis, especially in their chronic forms; but I have contented myself, in this place, with pointing out the following important facts:—

1st. That phthisis pulmonalis may exist and prove fatal, and yet,

during the whole of its progress, only give rise to the physical signs usually considered as indicative of bronchitis with emphysema.

2d. That such signs, when persistent with all the symptoms of phthisis, should render the physician very suspicious of the existence of pulmonary tubercle.

3d. That the analeptic treatment of such cases, and the avoidance of cough mixtures, or other means directed to the alleviation of mere symptoms, offers the surest means for procuring arrestment of the disease, and bringing about an ultimate recovery.

II. *Diagnostic Value of a Microscopic Examination of the Sputum.*

A proper appreciation of the structure of sputum requires a thorough knowledge of histology, as, mixed with the expectoration, may be found—1st. The natural secretion of the salivary and mucous glands, with the epithelial structures of the mouth fauces and pharynx. 2d. All the structures that enter into the composition of the bronchi and lungs, in various stages of disintegration. 3d. The results of various morbid processes, in different stages of development or disintegration, such as the inflammatory, tubercular, or cancerous exudations, extravasations of blood, earthy concretions, etc.; and, 4th, All kinds of substances which enter into the composition of food, which adhere to the mouth and teeth, such as starch corpuscles, and the different elements which enter into the composition of the various vegetable and animal substances used as aliment. Great pains and considerable time are also required in the examination, so as to satisfy the inquirer that nothing of importance has been overlooked.

Extensive examination of sputum with the microscope has, up to a recent period, served to persuade most scientific physicians that it was of little practical importance, inasmuch as percussion and auscultation yield us a more efficient and more exact means of determining the changes which go on in the lung. The recent careful examination of sputum, however, by Dr Andrew Clark,¹ as well as a case which has come under my notice, may induce them to modify that opinion.

¹ *Trans. of Patholog. Soc. of London*, vol. vi. p. 74.

Professor Van der Kolk of Utrecht¹ was the first who directed attention to the fragments of the elastic fibres of the lung in sputum, as occasionally being of diagnostic importance. That such fibres were common in the sputum of consumptives, after ulceration of the lung has commenced, is easily proved, and has been familiar to myself for the last fifteen years. The important part of Van der Kolk's Memoir, however, is contained in the following passage:—"But we ought to determine if these fibres are only observed when phthisis is already well advanced, and produced great ravages, or if they exist in expectorated matter at the first formation of vomicae, so that they enable us to determine their existence when commencing. My conviction, with regard to this important problem, is, that it is exactly at the commencement of phthisis, and at the first formation of a vomica, that the elastic fibres were present in the greatest abundance, and that they may then be considered as among the most positive signs we possess of the presence of a cavern. Later, when the cavity has acquired a certain extent, these fibres become more rare in the expectoration, and are with difficulty distinguished." This statement is supported by a case, in which very insignificant signs could be determined by auscultation, although the general symptoms indicated phthisis—yet, where the fibres existed in considerable numbers in the sputum, and led to a diagnosis, which was confirmed by the subsequent progress of the disease.

Such an instance as that described by Van der Kolk I believe to be very rare, and the question always arises whether the lungs were examined with sufficient care, so as to render it certain that, whilst fibres of elastic tissue, derived from those organs, existed in the sputum, no auscultatory sign could be detected. But that this does occasionally occur, I have now no doubt—1st, from the facts previously given, which show that advanced phthisis may exist without any positive signs; and, 2d, from the following case, which fully confirms the statement made by the distinguished Professor of Utrecht.

CASE IV. In August 1854, I was consulted when in London by a lady, Mrs B., æt. 23, who had for some time suffered from cough,

¹ *Nederlandsch Lancet*, 2 Serie. D. 1.

accompanied by mucopurulent expectoration. There was little emaciation, the general powers of the system did not appear to be much impaired, although she complained somewhat of weakness, and diminution of appetite. Frequent cough, with expectoration, were the principal symptoms. Careful percussion and auscultation of the chest (which was well-formed), elicited positively nothing: the percussion note was normal and equal on both sides; the respiratory murmurs distinctly audible, soft with their usual rhythm, free from all abnormal murmur—no increase of the vocal resonance. Repeated examination, especially in both sub-clavicular and supra-scapular regions, convinced me of this fact. The practitioner (W. T. Iliff, jun., Esq., of Kennington) who had previously attended her, and who was again subsequently called in, informed me, however, that she herself had an impression, that some time previously (in March), she was in the habit of spitting up fragments of her lungs. Mr Iliff had taken portions of the indurated matter expectorated to Mr Quekett, who, in fact, positively affirmed them to be pulmonary substance. At my request, Mr Iliff was so good as to forward to Edinburgh, a portion of the expectorated matter, discharged during the March previous to my seeing the patient. It consisted of an oblong substance, about one-third of an inch long and one-sixth of an inch in thickness, and presented all the characters of a piece of lung infiltrated with tubercle. On examining sections of it under a magnifying power of 250 diam. linear, I, with some difficulty (the structure having been preserved in alcohol), determined the existence of circular bundles of areolar and elastic tissue, obscured by a mass of molecular matter in which tubercle corpuscles were imbedded. That this tissue was really expectorated by Mrs B., Mr Iliff entertains no doubt, as he himself removed it from a tenacious mass of expectorated matter. Subsequent to our correspondence on the subject, he also submitted it to Dr Beale, and Messrs Quekett and Rainey, of London, all of whom agreed as to the fact of its being a portion of human lung.

During the winter of 1854-5, Mrs B. continued tolerably well, and without medical attendance. Mr Iliff, however, was again called in on the 7th of April, and found that the disease had been slowly progressing. The expectoration was now increased and more purulent, and she had sensibly lost flesh and strength. On the 25th of May, Dr Latham was consulted. There was then flattening at

the left apex, and in his opinion a cavity there. She had also hectic fever, copious night sweats, diarrhœa, haggard countenance, emaciation, in short, the usual symptoms of the advanced stage. From this time, notwithstanding the most judicious treatment on the part of her medical attendant, the disease progressed rapidly, and she expired, July 26th. An examination after death, revealed extensive tubercular disease in both lungs, with cavities in their apices; the left side being the one most affected.

The facts of this case serve, in my opinion, to establish, that there are instances in which the occurrence of disintegrated lung tissue may be detected by the microscope in the sputum, *before* any auscultatory signs are audible. On this latter point, I may observe that Mr Iliff could not detect such signs any more than myself, although he was in possession of the expectorated lung substance. There were also particular circumstances connected with my knowledge of the patient's friends, that made me unusually careful and anxious when making the stethoscopical examination, and certainly, in August 1854, five months after the pulmonary tissue was evacuated, there were no audible signs of phthisis pulmonalis. In reply to a question by me, as to how and when these signs first made their appearance, Mr Iliff stated that he could not tell, as, for many months, he was not in attendance. But I need scarcely remark that, between August 1854 and May 1855, there was ample time for the disease to have progressed to the formation of cavities.

All the circumstances of this case therefore, have impressed upon me the importance of a microscopic examination of sputum, whenever the symptoms, and a suspicion of phthisis pulmonalis exist, without any clear evidence being present derivable from auscultation.

III. *A Clinical Investigation into the Diagnostic Value of the Cracked Pot Sound (Bruit de Pot Fêlé of Laennec).*

I now propose to speak of that peculiar sound, which Laennec first likened to gently striking a cracked pot, and which, in his opinion, indicated the presence of a cavity, near the surface of the lung, in lean subjects with moveable ribs. It may be very closely

imitated by crossing the palms of both hands, so as to leave a hollow between them, and then striking the knuckles of the inferior hand against the knee, so as to produce a clinking sound. It is so peculiar as not easily to be mistaken, and can be produced in the living chest much more readily by the hammer and pleximeter than with the fingers. To this fact I directed attention in the *Monthly Journal* for December, 1854. I also pointed out in the *Journal* for last February, that a marked cracked pot sound had been produced in a case where there was no cavity, but, on the contrary, only a mass of indurated tissue, surrounded by healthy spongy lung. Since then I have paid great attention to the production of this sound, and found that it could be produced on percussion in chests affected with a variety of diseases, and presenting apparently different physical conditions. I have found it to be common in pneumonia, in pleurisy with effusion, and in several healthy chests. No doubt it is also present when cavities exist; but the general notion with regard to this sound being diagnostic of vomicae, which has prevailed since the days of Laennec, requires modification. Further, it is highly important that our views with regard to it should, if possible, be rendered more exact.

To this end, the investigation of which I have now to give an account was undertaken last summer, on one hundred patients, who entered the clinical wards. This number might now be greatly extended, but I prefer limiting the inquiry to what was then accomplished, as no new fact has been since elicited. The one hundred patients were taken indiscriminately as they presented themselves, the choice being in no way governed by a desire to obtain a preponderance of chest diseases. One ward contained nothing but skin diseases, with very few pulmonary complications. Notwithstanding, on careful percussion of the chests with the hammer and pleximeter, the patients' mouth being open, it was found that the cracked pot sound was distinctly produced in twenty-nine out of these one hundred cases. The name, age, physical condition of the chest, and, indeed, the history of every one of these cases, is minutely recorded in the ward books. I carefully percussed each chest myself publicly with the clinical class, and the following is a short tabular account of each case, in drawing up which I have been greatly assisted by my resident clinical clerk, Dr Wilson Fox.

I have thought it of some importance to print this account, *in extenso*, in order to satisfy auscultators that every care was taken in the examinations, and to show them at a glance, under what great apparent variety of conditions the same sound was produced. I have marked the twenty-nine instances in which the cracked pot sound was audible with a * and a number. But it is very instructive to observe how similar was the physical condition of the chest in many cases, which elicited no cracked pot sound, to those which did do so. In short, the investigation, it appeared to me, would have been very incomplete, if the negative, as well as the positive cases, had not been recorded. By examining a number of cases indiscriminately also, I was led to the discovery that the cracked pot sound was frequently producible in the perfectly healthy adult chest. Skoda and others allude to the fact that it may be occasioned by percussing the thorax of young children, a statement I have confirmed. But it may also, under certain circumstances, be elicited in the healthy adult chest, as the table will show:—

No. of Case.	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
1.	Reekie,	M.	22.	<i>Chronic Pleurisy</i> .—The left side is dull on percussion anteriorly, posteriorly, and laterally. Respiration is totally abolished, and there is Œgophony. The right lung is resonant, and the respiration harsh and loud.	There has never been any cracked pot sound.
2.	Helan,	M.	22.	<i>Pleurisy</i> .—Over the right chest, anteriorly, there is remarkable loudness on percussion, but, posteriorly and laterally, commencing at a line drawn vertically half an inch outside the nipple, there is complete and sudden dulness, not altered by change of posture. On auscultation over clear portion, loud cooing murmur accompanies inspiration, and double friction at the margin of dulness. Over dull portion, absence of respiration with Bronchophony. On left side respiration everywhere puerile, with increased vocal resonance.	A remarkably loud cracked pot sound over whole anterior surface of right side, which, in six days, subsided. A slight cracked pot sound also under left clavicle, of short duration. * 1.

No. of Case.	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
3.	Dick,	M.	36.	<i>Phthisis</i> .—On percussion, dulness under both clavicles — most marked under left. Slight dulness at right base posteriorly. (Patient was admitted a month previously with pleurisy on this side.) Respiration under left clavicle harsh and blowing. Expiration greatly prolonged. Fine moist râle in right mammary region. Imperfect pectoriloquy exists under left clavicle. No râle.	Distinct cracked pot sound under left clavicle. * 2.
4.	Penman,	M.	35.	<i>Phthisis</i> .—On percussion, dulness under both clavicles — most marked under left. Dulness at left base posteriorly. Except under clavicle, percussion of right lung gives good resonance. Respiration under left clavicle harsh, with prolonged blowing expiration, and attended with large loose râle. Fine moist râle, audible at left base posteriorly, where respiration is weak and distant. Over whole of right lung respiration harsh and expiration prolonged. Pectoriloquy under left clavicle. Vocal resonance increased under right.	Cracked pot sound exists under both clavicles. * 3.
5.	Gaffney,	M.	14.	<i>Enlarged Spleen and Liver. Leucocythemia</i> .—Dulness over whole of left side, as high as 2d rib. Right side above 4th rib in front and 7th rib behind, is resonant. Respiration feeble on left side, exaggerated on right. No râle on either side.	None.
6.	Baur,	M.	6.	<i>Favus of Scalp</i> .—No dulness on percussion over any part of chest. Respiration healthy throughout. Chest walls very elastic.	Loud cracked pot sound can be elicited on both sides over the whole space between clavicle and nipple. * 4.
7.	Campbell,	M.	43.	<i>Phthisis, Capillary Bronchitis</i> .—Percussion shows slight general dulness over both lungs. Marked dulness under left clavicle. Fine moist râles audible	Cracked pot sound loud on left side, not on right. * 5.

No. of Case.	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
8.	M'Queir,	M.	19.	over both lungs, in front and behind. Vocal resonance greatly increased under left clavicle, with fine moist râle. June 14. Loud gurgling under left clavicle, with pectoriloquy. <i>Pneumonia.</i> — Percussion shows dulness of whole of lower two-thirds of right lung, both in front and behind. Under right clavicle, the percussion note is tympanitic in character. Left lung gives good percussion. Respiration on left side and under right clavicle exaggerated. Over dull part of left lung it is bronchial, and attended with fine crepitation. Vocal resonance over dull part bronchophonic, under right clavicle somewhat intensified.	Cracked pot sound can be elicited under right clavicle not under left. * 6. This sound continued after patient's recovery, when all physical signs had disappeared.
9.	Davidson,	M.	53.	<i>Right Pleuro Pneumonia.</i> — On percussion base of right lung is dull both anteriorly and posteriorly, at the apex there is resonance. Left lung resonant throughout. On auscultation there is bronchial breathing over base of right lung, both in front and behind. Both friction and fine crepitation audible in left axillary region and at angle of scapula. Vocal resonance increased posteriorly. Left lung healthy.	Cracked pot sound under both clavicles. * 7.
10.	Storer,	M.	50.	<i>Chronic Pneumonia of Left Apex.</i> — Percussion gives dulness over upper third of left lung both anteriorly and posteriorly. Right lung resonant throughout. Bronchial breathing with fine crepitation, heard over apex of left lung. Vocal resonance here bronchophonic. Respiration over right lung healthy.	Cracked pot sound elicited over left infra clavicular region, not in right. * 8.
11.	Russell,	F.	34.	<i>Morbus Cordis.</i> — On percussion there is dulness at left base posteriorly. Good resonance under both clavicles. Breathing harsh, with fine crepitation and	Loud cracked pot sound under left clavicle, faintly marked under right. * 9.

No. of Case.	Name.	Sex.	Age.	Diseases and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
				increased vocal resonance at left base posteriorly. Right side healthy.	
12.	Taylor,	F.	30.	<i>Phthisis</i> .—On percussion dulness exists at apices of both lungs, most marked at left. Respiration under both clavicles harsh, with prolonged expiration, attended at left apex, with a thin gurgling râle, and at night with sibilant and sonorous râles. Pectoriloquy at both apices.	Marked cracked pot sound under left clavicle. None under right. * 10. Disappeared before death.
13.	McKinna,	F.	34.	<i>Arrested Phthisis</i> .—On percussion resonance tolerably good at both apices and over both sides of chest. Respiration somewhat harsh at apices. No râles.	None.
14.	Cooke,	F.	20.	<i>Chronic Pneumonia, Recovering</i> .—Percussion gives slight dulness at base of right lung posteriorly. Resonance good over left lung. Respiration bronchial at base of right lung, and vocal resonance increased. Respiration healthy on left side. With the mouth shut the percussion note is clear.	Cracked pot sound exists under both clavicles. * 11.
15.	Keith,	F.	34.	<i>Morbus Cordis, Emphysema</i> .—On percussion resonance good over both lungs. Sibilant and sonorous râles heard at both bases posteriorly.	Cracked pot sound exists under right clavicle, not under left. * 12.
16.	Duncan,	F.	26.	<i>Chronic Pneumonia</i> .—On percussion there is dulness over whole of left side posteriorly, and under left clavicle as low as 4th rib. Bronchial breathing over whole of left side, with increased vocal resonance. Crepitation audible both anteriorly and posteriorly. Right side healthy.	Cracked pot sound exists under both clavicles. * 13.
17.	Boyle,	F.	30.	<i>Emphysema, Bronchitis</i> .—On percussion, resonance good on both sides. Sibilant and sonorous râles on both sides of chest.	None.
18.	Richmond,	F.	?	<i>Phthisis</i> .—Percussion gives slight comparative dulness under right	None.

No. of Case.	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
				clavicle, with slight harshness of inspiration, prolonged expiration, and increased vocal resonance. No râles. Left side healthy.	
19.	Roach,	M.	32.	<i>Phthisis</i> .—Dulness on percussion exists under both clavicles, most marked under left. Respiration harsh under right clavicle, with prolonged expiration. Under left, friction attends respiration; expiration loud, prolonged, and blowing. Loud, dry, cavernous râle exists under right clavicle, not under left. Vocal resonance increased under right clavicle. Under left, distinct pectoriloquy is heard.	Cracked pot sound exists under both clavicles, most marked under left. * 14.
20.	Stewart,	M.	56.	<i>Phthisis</i> .—On percussion dulness is found at both apices anteriorly. Harsh respiration at both apices. Increased vocal resonance at both apices, amounting to imperfect pectoriloquy on left side. Fine moist râle at right apex. Dulness, with a fine moist râle at both bases.	None.
21.	Currie,	M.	14.	<i>Pleurisy</i> (four weeks)—June 16th, On percussion, there is dulness on left side anteriorly as high as 2d rib, above this point the percussion tone is loud. Dulness on left side behind as high as spine of scapula. Percussion resonant over whole of right side. Respiration faintly audible over left side anteriorly, attended with fine friction from clavicle to nipple. Posteriorly respiration every where feeble, with friction below angle of scapula. On right side respiration puerile. Vocal resonance equal under both clavicles. June 23d.—The loud tone, on percussion under left clavicle, has disappeared. The other physical signs continue the same.	June 16th, Cracked pot sound under left clavicle, none under right. * 15. June 23d, No cracked pot sound can be elicited anywhere over chest.
22.	Aitken,	M.	46.	<i>Chronic Double Pleurisy, with Re-</i>	Cracked pot sound

No. of Case	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
				<p><i>traction of Right Side.</i> On percussion the whole of right back is dull, as high as spine of scapula. Right base anteriorly somewhat dull. Under clavicle clearer than elsewhere, but duller than on left side. On left side resonance good except at base posteriorly, where sound elicited is deficient in tone. Distant bronchial breathing over whole right side. Vocal resonance under right clavicle greatly increased. No œgophony. Respiration under left clavicle normal; here there is no increase of vocal resonance. At left scapular and infra mammary regions, friction may be heard.</p>	<p>under both clavicles—is more marked under left than under right. * 16.</p>
23.	Smith,	M.	18.	<p><i>Pleurisy.</i>—June 2d. On percussion dulness on right side in front as high as 3 inches below clavicle. Above this, up to clavicle, there is a tympanitic note. Posteriorly dulness as high as infra spinous fossa. On left side percussion normal. On auscultation, respiration over tympanitic spot blowing, with fine friction below; this is inaudible in front. Posteriorly, respiration audible all over back, but very weak. No friction. Vocal resonance greatly increased under clavicle. Respiration natural, though exaggerated on right side.</p> <p>July 7th. Dulness now reaches to apex of right lung both in front and behind.</p>	<p>Cracked pot sound can be elicited over tympanitic spot under right clavicle, not under left. * 17.</p>
24.	Lumsden,	M.	25.	<p><i>Diabetes Mellitus.</i>—On percussion, immediately under both clavicles percussion sound healthy. On left side, for 2 inches below 2d rib there is dulness, but not absolute. On right side, percussion good throughout. Auscultation healthy. Respiration healthy</p>	<p>None.</p>

No. of Case.	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
				in both lungs, except over dull spot on left side, where the breathing is faintly bronchial, and vocal resonance increased. No râle.	
25.	Phillips,	M.	41.	<i>Incipient Phthisis</i> .—On percussion, resonance somewhat less clear under right clavicle than under left. Right base posteriorly less resonant than left. On auscultation, respiration slightly harsh at right apex anteriorly, with a little fine moist râle inaudible at close of inspiration. Jerking respiration at right base. Left lung healthy.	None.
26.	Crawley,	F.	4½.	<i>Purpura</i> .—Percussion gives good resonance over whole of chest. Respiration normal.	Cracked pot sound exists under left clavicle, not under right. * 18.
27.	M'Bride,	F.	24.	<i>Phthisis</i> .—On percussion dulness exists under left clavicle. Under right there is unusually clear resonance. Sibilant and sonorous râles, and a coarse moist râle under left clavicle. Sibilant and sonorous râles under right clavicle.	None.
28.	Aiken,	F.	9.	<i>Fever, Pneumonia, Bronchitis</i> .—Percussion gives dulness over right lung both in front and behind, except immediately under the clavicle where it is clear. Over left lung percussion is good. Sonorous and a little moist râle over left lung. Both fine and large moist râle over right lung both in front and behind. Vocal resonance inaudible.	Cracked pot sound exists distinctly under right clavicle, not under left * 19.
29.	Drummond,	M.	67.	<i>Morbus Cordis</i> .—June 27th, Percussion over right side of chest is dull both in front and behind. On left side it is resonant. On auscultation, respiration on right side harsh, with fine moist râle both in front and posteriorly, and considerable increase of vocal resonance. Respiration	June 27th, Cracked pot sound exists under both clavicles. * 20.

No. of Case.	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
				on left side normal. No râle. No increase of vocal resonance. July 18th, Percussion clear over both lungs. Some sibilant râles in both. No moist râles. No increase in vocal resonance.	July 18, Can be elicited under left clavicle, during inspiration, not under right. * 21.
30.	M'Kenzie,	M.	36.	<i>Phthisis</i> .—On percussion, dulness on right side in front as low as 4th rib. Whole of lung dull posteriorly. Left side clearer than right. Sonorous râle, and coarse moist râle both in front and behind. Vocal resonance increased, especially under right clavicle. Large moist râles on left side both anteriorly and posteriorly.	None.
31	M'Queenie,	M.	25.	<i>Dyspepsia, Emphysema, Bronchitis</i> .—Loud resonance over whole of chest. Sonorous and sibilant râles on right side in front.	None.
32.	Ogilvie,	M.	18.	<i>Chronic Vomiting</i> .—Percussion gives slight dulness under right clavicle. None under left. On auscultation, under right clavicle, inspiration slightly harsh and jerking in rhythm. Expiration not prolonged. Vocal resonance greatly increased. No râle. Under left clavicle respiration normal.	Loud cracked pot under right clavicle, none under left. * 21.
33.	Anderson,	M.	31.	<i>Emphysema, Bronchitis</i> .—Clear resonance over chest. Sibilant and sonorous râles, with respiration on both sides.	None.
34.	Smith,	F.	19.	<i>Rheumatism</i> .—Healthy Lungs. Percussion gives good resonance over both. Respiration healthy over whole of chest.	Loud cracked pot note under left clavicle, none under right. On entering, a month ago, none was observable. * 22.
35.	Smith,	F.	19.	<i>Rheumatism</i> .—Healthy chest.	Faintly producible under right clavicle. * 22.

No. of Case.	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
36.	Mure,	M.	13.	<i>Fever</i> .—Percussion slightly dull at both bases posteriorly. Good resonance anteriorly. Sibilant râles at both bases.	None.
37.	Abernethy,	M.	41.	<i>Albuminuria</i> .—Percussion clear under both clavicles. Slight dulness and increase of vocal resonance at left base posteriorly. No râle.	Cracked pot sound under both clavicles. More marked under left than under right. * 24.
38.	Marshall,	M.	11.	<i>Favus of Scalp</i> .—Lungs healthy but chest wall very elastic.	Cracked pot sound can be elicited under both clavicles. * 25.
39.	Clarke,	M.	15.	<i>Impetigo of Face</i> .—Lungs healthy. Chest wall very elastic.	Present under both clavicles. * 26.
40.	M'Queen,	M.	57.	<i>Chronic Eczema</i> .—Lungs healthy. Percussion everywhere good. Respiration normal, and no increase of vocal resonance.	Marked cracked pot sound under left clavicle, none under right. * 27.
41.	Riddell,	F.	21.	<i>Diarrhœa</i> .—Lungs healthy. Percussion normal over whole of chest. Respiration healthy.	Cracked pot sound exists under left clavicle, not under right. * 28.
42.	Hogg,	F.	22.	<i>Morbus Cordis</i> .—Slight dulness on percussion over whole of right side. No râle.	None.
43.	Collins,	F.	21.	<i>Phthisis</i> .—On percussion, resonance deficient under both clavicles. Harsh inspiration under both, accompanied on right side by loose moist râle. Vocal resonance somewhat exaggerated, but equally so on both sides.	None.
44.	Macdonald,	F.	24.	<i>Phthisis</i> .—Dulness exists on percussion under both clavicles, more marked under right than under left. Loose moist râle under both clavicles, more under left than right. Vocal resonance intensified under both.	None.
45.	King,	F.	26.	<i>Morbus Cordis</i> .—Percussion normal under clavicles. Dulness with loose moist râle at both bases posteriorly.	None.

No. of Case.	Name.	Sex.	Age.	Disease and Physical Signs of Chest.	Cracked Pot Sound, with Observations.
46.	Bonts,	M.	18.	<i>Phthisis, Hemoptysis.</i> —On percussion, dulness under left clavicle. Whole left side somewhat duller than right both in front and behind. Harsh inspiration under left clavicle. Expiration almost inaudible. Vocal resonance and fremitus increased. No moist râles. Percussion and respiration on right side are normal.	Slight cracked pot sound under left clavicle, none under right. * 29.
47.	Peacock,	M.	46.	<i>Chronic Pleurisy</i> (12 weeks) <i>with Bulging of Right Side.</i> —Percussion dull on right side in front as high as 2d rib. Above this normal. Absolute dulness over whole of right back. Left side, percussion normal both in front and behind. Under right clavicle respiration is bronchial. Vocal resonance and fremitus are greatly increased here. Faint bronchial breathing audible over whole of right side. Rough friction heard at different parts. Left side, respiration exaggerated, otherwise normal.	None.
48.	to 100,			<i>Various Diseases.</i> — Chest healthy.	None.

In now endeavouring to analyse the above facts, it is important to observe, 1st, that the cracked pot sound was frequently absent in cases where our preconceived notions would have induced us to look for it. This was very observable in cases of phthisis, with all the signs of a cavity, as in Nos. 20, 27, 30, 43, and 44; and in two of these (Nos. 27, 30) the lungs were examined after death, and cavities were found, although of comparatively small extent. 2d, A second point of importance is that it was found to be frequently present in pulmonary diseases where there was no cavity, as in four cases of pleurisy, and several instances of pneumonia. 3d, It was shown to exist in several cases where neither symptoms or signs gave any evidence of disease of the lungs. 4th, It was frequently observed in the same individual to come and go, evidently

in consequence of changed physical condition in the lungs during the progress of the case.

With regard to the twenty-nine cases in which cracked pot sound was present, they may be arranged as follows:—Pleurisy, 4; pneumonia, 5; plenro-pneumonia, 1; phthisis, 6; other diseases with pulmonary complication, 5; pulmonary organs healthy, 8.

Pleurisy.—Of the four cases of pleurisy (Nos. 2, 21, 22, 23), three were acute, affecting one side only, and one chronic, affecting both sides. Of the acute, two were on the right side, and one on the left. In the three acute cases, there was in all of them, immediately under the clavicle of the affected side, unusual clearness on percussion, and the production of the cracked pot sound was limited to the resonant space. Where double pleurisy existed (No. 22), there was resonance under both clavicles, and the cracked pot sound was elicited on both sides. In another case of pleurisy (No. 1), in which the whole of the left side was dull, without resonance, on percussion anywhere, there was no cracked pot sound.

The analysis of these five cases of pleurisy therefore, in four of which the cracked pot sound was produced, whilst in one it was not, indicated, that it is only when this disease is partial—that is to say, where a small portion of resonant lung still remains—that the sound can be produced. So far as these cases, therefore, are concerned, it would seem that there must exist a portion of spongy lung—that is, a portion of air—in the chest, in order that the peculiar sound may be elicited. That this, however, is not the only condition seems indicated by a sixth case (No. 47), where there was dulness on the affected side everywhere posteriorly and anteriorly, except in the space above the second rib, where percussion was normal, and where no cracked pot sound could be produced. It is probable, therefore, that the spongy lung in pleurisy, forced upwards and compressed, must be in some peculiar state of tension in order that percussion over it produce the peculiar noise we are treating of. This seems proved by the fact that it is only in the four cases where the percussion note was unusually clear and tympanitic that cracked pot sound was caused, whilst in the case where the resonance was normal, and in the one where no resonance existed, it could not be produced. This conclusion is further strengthened by the fact that in No. 21, as soon as the loud tone on percussion under the left clavicle had disappeared, and in No. 23, as soon as dulness invaded

the apex of the affected side, then the cracked pot sound could no longer be elicited.

Pneumonia.—Of the five cases of pneumonia, in which cracked pot sound was elicited (Nos. 8, 10, 14, 16, 28), two were acute, and three already chronic when the observations were made. Of the acute cases, in one (No. 8), the disease affected the lower two-thirds of the right lung, and percussion in the upper third was clear, where the cracked pot sound could be produced. In the other (No. 28), the disease affected the whole right lung, except the apex anteriorly; and the cracked pot sound was audible under the right clavicle. Of the chronic cases in one (No. 10), the disease was confined to the upper third of left lung, where cracked pot sound was produced. In the other two (Nos. 14, 16), the sign was audible under both clavicles, although, in the first, the disease was confined to the base of the right lung, and in the other it affected the greater portion of the left lung only.

From these facts, it seems evident that, although the same physical conditions may possibly exist in pneumonia as in pleurisy—namely, portions of spongy lung, rendered more or less tense by neighbouring condensation—there must be some other cause capable of producing the cracked pot sound. Hence, why should it exist over the healthy, as well as over the diseased pulmonary organs? Its occurrence over healthy lungs will be subsequently alluded to. Among the 100 cases examined, there were no others than those above mentioned, so that, in every unequivocal case of pneumonia which occurred, the cracked pot sound was elicited.

Pleuro-Pneumonia.—In the single case of this disease (No. 9), in which the symptoms and signs of pleurisy and pneumonia occurred together, the cracked pot sound could be elicited under both clavicles, although dulness on percussion was only present at the base of the right lung, whilst at the apex it was resonant. This case, therefore physically, resembles the two instances of chronic pneumonia just alluded to.

Phthisis Pulmonalis.—Among the 100 cases examined were 14 cases of phthisis, in 6 of which the cracked pot sound could be produced, whilst in 8 it could not. Of the 6 cases (Nos. 3, 4, 7, 12, 19, and 46), the cracked pot sound was heard only under the left clavicle

in 4 (Nos. 3, 7, 12, 46); and under both clavicles in 2 (Nos. 4, 19). In all the cases, it is stated, that wherever the cracked pot sound could be produced, there was dulness on percussion, which was associated with more or less moist râle, or hoarse inspiration, with increased vocal resonance. The uniform dulness of percussion in phthisical cases contrasts remarkably with the equally uniform clearness in cases of pleurisy. It follows, that neither dulness nor clearness on percussion is necessary for the production of this peculiar sound.

Of the six cases of phthisis in which cracked pot sound could be produced, we had an opportunity of examining the body after death in four. Before proceeding to open the thorax, I endeavoured to produce the sound by percussing the dead chest, and after making an opening in the trachea, and keeping the edges of the incision apart with a pair of forceps, I succeeded in doing so in three out of the four cases (Nos. 4, 7, 19), but not always on both sides after death, when it had been heard on both sides during life. The following are the facts elicited by dissection of the lungs in the four cases referred to.

No. 4. *Penman*.—After opening the trachea, the cracked pot sound could be elicited over the cartilage of left fourth rib, but nowhere else. *Left Lung*.—The pleuræ everywhere firmly united by dense adhesions, but at the apex they were somewhat softer than elsewhere. In the substance of the lung, half an inch from the apex, was a cavity about five-eighths of an inch in its longest diameter, lined by a distinct membrane, and quite empty. The surrounding tissue considerably infiltrated with tubercle, having, however, a considerable amount of crepitant lung, so that it floated in water. Posteriorly and inferiorly the lung was highly congested and œdematous. Several small bronchi were obstructed by clots of blood. *Right Lung*.—Pleuræ, on this side adherent over upper third of lung. The whole of upper lobe infiltrated with tubercle, and congested; not so spongy as on the other side, and readily sank in water. In the upper third of the lobe were several small cavities. Lower lobes considerably congested, but free from tubercle. In this case the cracked pot sound could be produced, during life, on both sides.

No. 7. *Campbell*.—On opening the trachea, a loud cracked pot sound could be elicited under the left clavicle. *Left Lung*.—Pleuræ everywhere firmly adherent, especially at the apex, where the united pleuræ were thickened nearly half an inch. Immediately under the

clavicle there was a cavity the size of a small orange, lined by a membrane, and traversed by bands of pulmonary substance. The rest of the upper lobe was densely infiltrated with tubercle, and here and there were cavities varying in size from a pea to a hazel nut. Throughout the lower lobe, tubercle, also infiltrated, but to a less amount. *Right Lung*.—Pleuræ not adherent. A few tubercles were scattered through the upper lobe, but to no great extent. A considerable mass of crude tubercle also was infiltrated into the tissue of the inferior lobe. In this case the cracked pot sound could be produced during life only on the left side.

No. 12. *Taylor*.—No cracked pot sound could be produced on the dead chest. *Left Lung*.—Pleuræ everywhere firmly adherent, especially at the apex, where they were much thickened. In the upper lobe were several cavities, the largest occupying the apex, and capable of containing a large orange. It was lined by a distinct membrane, and bounded anteriorly and posteriorly by very thin walls, in a few places composed only of the thickened pleuræ. Superiorly it communicated with several smaller cavities, which varied in size from that of a pea to that of a large bean. The intervening pulmonary tissue was densely infiltrated with tubercle. Numerous grey granulations were scattered irregularly through the inferior lobe, and the whole presented here and there a blueish and black tint from pigmentary deposit. *Right Lung*.—The pleuræ were only adherent at the apex, where they were much thickened. The summit of the lung was dense, and indurated from numerous puckerings and cicatrices in its substance, associated with cretaceous concretions. At the extreme apex in front was a cavity capable of holding a large walnut, surrounded by indurated and almost cartilaginous-like walls, and lined by a distinct membrane. The two inferior lobes contained several masses of grey tubercle, and the anterior free margin was very emphysematous. In this case the cracked pot sound could only be produced during life on the left side.

No. 19. *Roach*.—The trachea being opened, a cracked pot sound was elicited under the clavicle on the left side, but not on the right. *Left Lung*.—Pleuræ everywhere firmly adherent. The upper third of the lung was converted into a large cavity, covered only superiorly by the thickened pleuræ. It was traversed in various directions by bands of indurated tissue, and communicated inferiorly with smaller cavities all filled with pus. The inferior portion of the lung was throughout infiltrated with tubercle in various stages of softening.

With the exception of a small portion at the extreme base posteriorly, no part was spongy. *Right Lung*.—Pleuræ universally adherent. At the apex was a cavity of irregular form, measuring one inch and a-half in its longest diameter. It communicated inferiorly with several smaller ones,—the intervening pulmonary substance, and the inferior lobes, everywhere infiltrated with tubercle, but not so dense or so much softened as on the other side. In this case the cracked pot sound could only be produced during life on the left side.

In all these cases, where a cracked pot sound was producible, it is to be remarked that a cavity was found after death, but in the case of Taylor (No 12), it happened that although a large cavity existed on the right side, no cracked pot sound was audible. Hence, although in phthisis where a cracked pot sound is produced, it is often found associated with a cavity, it follows that cavities may exist, without giving rise to this particular sign. The inquiry with regard to phthisis, however, cannot be considered to be complete, unless we attend to the eight cases of that disease, in which the sound could not be elicited.

Of the eight cases (Nos. 13, 18, 20, 25, 27, 30, 43, 44) of tubercular lungs in which no cracked pot sound could be produced, there were three, which presented the signs of softening at the apex (Nos. 20, 30, 44). In the two first, the lungs were examined after death with the following results:—

No. 20. *Stewart*.—No cracked pot sound could be elicited by percussion on the dead chest, after making an opening into the trachea. *Right lung*.—Tubercle very generally infiltrated throughout the whole of lung, having little spongy tissue. About an inch below the extreme apex was a cavity the size of a hazel-nut. *Left lung*.—Tubercles were scattered through the lung, dense at apex, but no cavity.

No. 30. *Mackenzie*.—The chest was not examined by percussion after death. *Right lung*.—At the extreme apex posteriorly, was a cavity the size of a small walnut, traversed by bands of indurated lung tissue, and lined by a distinct membrane. Tubercle was very extensively infiltrated through the inferior lobes, having however considerable portions of spongy tissue. *Left lung*.—This lung was more extensively affected with tubercle than the opposite one, and at the apex were three anfractuous cavities, the largest the size of a hen's egg.

It results from these facts, that cavities may exist in the lungs similar in position, size and character with those over which a cracked pot sound may be elicited on percussion, without in themselves furnishing all the conditions necessary for its production. In the last two cases in which the lungs were examined after death, it will be seen that their respective ages were 36 and 44, and the elasticity of the chest might have been diminished. Again, it must occasionally happen, that in such instances direct communication with the bronchial tubes may be temporarily cut off, or prevented, and hence the absence of the sound in question. On such a point, it is impossible to speak with certainty. But still the comparative frequency with which the sign may be elicited over tubercular cavities, renders it when present, in conjunction with other signs and symptoms of the disease, highly diagnostic of a cavern. It cannot be considered an infallible sign, however, even in phthisis, as it may be occasioned by mere indurated tubercular lung, as in the case I recorded in the Journal for February 1855, when the same physical conditions exist as in pneumonia at the apex.

Diseases with congested, collapsed or emphysematous pulmonary complications.—These were five in number (Nos. 11, 15, 29, 32, 37). Of these there were three with *morbus cordis*, a disease in which pulmonary lesions are frequently induced (Nos. 11, 15, 29). One case is called “Chronic Vomiting,” from the leading distressing symptoms which accompanied it (No. 32), whilst the other was a case of Bright’s disease. In these five cases, the cracked pot sound was produced under both clavicles in three (Nos. 11, 29, 37), and under the right clavicle only in two (Nos. 15, 32). In determining the physical signs present in these cases, it will be found that physically they were essentially the same, and presented similar exceptional facts, as occurred in other instances previously noticed. Thus in the three cases of *morbus cordis*, there was either dulness posteriorly and inferiorly, with resonance superiorly, or there were evidences of chronic bronchitis and emphysema. In the case of chronic vomiting, there was dulness under the right clavicle, where the cracked pot sound was elicited, and in the case of Bright’s disease, percussion under both clavicles, was unusually clear, and the cracked pot sound was heard on both sides. These cases, therefore, only confirm the observations made in previous ones, namely, that the cracked pot sound may be produced over parts, which are either

dull or clear on percussion, and that it is not pathognomonic of any special pulmonary lesion.

Diseases without pulmonary complication.—The importance of percussing every case indiscriminately, whether there was disease of the pulmonary organs or not is evident, from our having been led to the discovery, that in eight cases out of the hundred, in all which the lungs were perfectly healthy, cracked pot sound could be elicited. (Nos. 6, 26, 34, 35, 38, 39, 40, 41). Skoda and Walshe allude to the fact, that in young children, it can easily be produced. Indeed, I have found that if a child between the ages of three and six years, takes a deep inspiration, and holds its breath for a moment, we can then always elicit the sound. But the ages of the eight cases of which we are now speaking were as follows, viz.:— $4\frac{1}{2}$, 6, 11, 15, 19, 19, 21, and 57 years. Thus, seven out of the eight were not above 21 years, and four not above 15 years. In one man, however, nearly sixty, with a perfectly well formed chest, the sound could also be produced. It follows that if this sign be so common in healthy chests, and especially in young persons, who are so commonly the subjects of phthisis, we have at once an explanation of how it happens, that the cracked pot sound may be elicited, even on the side of the chest where no disease exists, and why it is often double when only one lung is affected. There can be little doubt that the frequency of this sign in healthy chests is connected with the elasticity of the thoracic walls. It would also appear, from its constancy during a deep inspiration in children, that the tensivity of air within the chest, alluded to under the head of pleurisy, is also an important condition.

Such then are the apparently opposing and puzzling facts, to which a careful analysis of the 100 cases have led us. Let us now endeavour to ascertain, 1st, what theory of the production of the cracked pot sound is consistent with these facts, and 2d, what utility the production of this sound is likely to serve as a diagnostic sign of disease.

1st. Theory of the Production of the Cracked Pot Sound.

Any true theory of the production of the cracked pot sound must embrace all the known facts. It follows that, inasmuch as it may be produced in cases of pleurisy, pneumonia, and even in the healthy chest, the existence of a cavity, as supposed by Laennec, or of a mixture of air and fluid, as stated by Piorry, is not essential. According

to Skoda, when percussion is made over a cavity, it is compressed at each stroke, and a portion of air suddenly driven out of it into the bronchial tubes; the hissing murmur, caused by the escaping air, is mixed up with the ordinary percussion-sound of cavities, and this compound noise represents the cracked pot sound. That part of the theory, however, which considers a cavity necessary, is shown by the preceding facts to be incorrect.

It has been noticed by various observers, especially by Graves, Stokes, Williams, Hudson, Walshe, and Markham in this country, and by Martinet, Andral, Piorry, Reger, Skoda, Winterich and others abroad, that a peculiar tympanitic tone, on percussion, is frequently produced in cases of pleurisy and pneumonia. An inquiry into the causes of these tympanitic and non-tympanitic sounds, or a review of the theories of Graves, Skoda, and others, is not my present object, and would lead me too far from the immediate subject of this investigation. Two excellent papers have recently been published regarding them by Markham¹ and Winterich.² The preceding facts, however, will show that the cracked pot sound is producible sometimes with the tympanitic and sometimes with the non-tympanitic percussion note, and it appears to me that, had attention been more carefully directed to the first sound instead of so exclusively to the latter phenomena, it would have probably been ascertained long since to have been as distinct and frequent as I have demonstrated it to be. Dr Markham observes of a case, in which there was an amphoric percussion sound, that on one occasion both he and Dr Sibson noticed distinctly the cracked pot sound, near the same spot. The *post-mortem* examination showed that the right lung was gorged with blood and serum, but everywhere still retaining some portion of air.

On carefully considering what are the necessary conditions for the production of this peculiar sound, comparing these with the facts detailed, and referring to the well-known modes of producing the sound artificially, 1st, with the two hands crossed, and, 2d, by percussing with the pleximeter on a bladder containing a small quantity of air, it appears to me they are, as regards the chest, 1st, A certain amount of confined or tense air in the tissue of the lung; 2d, The sudden compression of this air by a solid body in its neighbourhood; 3d, Communication of this air with the external atmosphere.

¹ *Monthly Journal*, June 1853.

² *Medizinischen Neuigkeiten*, 5 Jahrgang.

1st. That a certain amount of air must be present is proved by its existence in all the twenty-nine instances in which the sound could be elicited. Thus in pleurisy encroaching on the lung from below upwards, percussion is clear under the clavicles. Where the entire thorax was dull, there was no cracked pot sound (No. 1). We have also previously alluded to the fact, that in one case (No. 21), as soon as the clearness of tone under the clavicle had disappeared, and, in another (No. 23), as soon as dullness invaded the apex of the affected side, the cracked pot sound could no longer be produced. The same observation applies to the cases of pneumonia, pleuro-pneumonia, congestion or collapse, proceeding from below upwards. On the other hand, where percussion is dull, as in pneumonia affecting the upper third of the lung, the confined air must exist below the diseased part, and be affected by the blow on percussion. In phthisis, with cavities, isolated or anfractuons, this condition is easily found. In healthy chests, especially in children, it may be easily demonstrated to occur, just when the chest is distended with air, as at the end of inspiration, thus affording the first essential condition.

2d. The sudden compression of the confined or tense air seems also to be a necessary condition in the production of the sound. This, however, may be effected in various ways. The blow of the hammer was in all the twenty-nine cases the immediate cause, but this could not operate in compressing the air unless the walls of the thorax were elastic, as we have shown it to be in most of those in whom the chest was healthy; or, unless in cases of diseased chest, the blow communicated vibrations to indurations over the lung, which thereby compressed the air. In the former case the blow would act directly, in the latter, indirectly. Hence why in some lungs with elastic thoracic walls, during inspiration, it may be produced without disease, and why when elastic indurations occur, as in pleurisy, pneumonia, or phthisis, it may be elicited in disease. I have frequently observed, when percussing diseased chests, that the cracked pot sound diminishes in intensity after repeated percussions, I presume from the tensivity of the air being diminished, by portions of it which have in this way been squeezed out of the space percussed.

3d. That there should be a communication between the air in the chest, and the external atmosphere, is proved by the invariable necessity of having the mouth and nostrils open before the cracked pot sound can be produced, and its immediate disappearance on

shutting the mouth. After death, also, it can never be produced without previously making an opening in the trachea, or securing patency of the larynx. The necessity of this condition indeed serves, in my opinion, to explain how it happens that in several cases where cavities exist in the lung—that is to say, where confined portions of air are present, with elastic chests or indurated surrounding tissue—still the sound is not elicited. For it is easy to conceive that in such cases, the bronchi leading to the external atmosphere, or the cavities themselves, may at various times be filled with purulent secretion, mucus, blood, or other fluid, and that swelling of the bronchial lining membrane, or compression of the tube, may cut off the communication so necessary for the production of a peculiar note on percussion. Hence it appears to me why in phthisical cavities the sound comes and goes—why it may be present or absent before death—but above all why this is no more an invariable sign of a morbid state than any other with which we are acquainted.

Although these appear to me to be the conditions necessary for generating the sound, it is very difficult to determine the exact physical state at any one time necessary for its production. I believe, however, it will be found to reside in a mixture of solid and aeriform parts, the latter of which are capable of being compressed by the blow of percussion. Sometimes the former surround the latter, as in the case of a cavity. At others, the latter lie over, or upon the former, as in cases of pleurisy and dulness at the base; and occasionally the former lie upon or over the latter, as in pneumonia or infiltrated tubercle at the apex. In healthy chests a similar condition is produced by a full inspiration with elastic thoracic walls—as it is in a dead stomach rendered somewhat tense by air—in which last case, by percussing with a pleximeter, and bringing the two walls of the organ near each other, the cracked pot sound may be produced—a statement originally made by Skoda, and the correctness of which has frequently been confirmed by myself.

Diagnostic Value of the Cracked-Pot Sound.

A phenomenon which occurs in the general run of hospital cases, so frequently as twenty-nine in a hundred, and which was audible in twenty-one out of thirty-six pulmonary diseases in that hundred, must probably be considered a more common sign than any other with which we are acquainted. The character of the sound, also, is so peculiar and distinctive, is so easily produced when percussion is properly

performed, and so little likely to be confounded with anything else, as to demand our careful attention. Yet it must be clear that it is in no degree pathognomonic, as it may be present in a variety of morbid states, and exists far more commonly in health, as we have shown, than is generally supposed. All these circumstances, however, are by no means opposed to its value in a diagnostic point of view. Indeed nothing, perhaps, has so much tended to throw discredit on the physical diagnosis of diseases of the chest, or been more mischievous in practice, than the attempts to connect particular diseases with particular signs, of which the notion that crepitation is diagnostic of pneumonia, and that dulness on percussion under the clavicle is diagnostic of phthisis, are striking examples. Hence, although, *per se*, the cracked pot sound is of little value—of no more, indeed, than any other individual sign; it is, when conjoined with other signs *and symptoms*, capable, in no small degree of assisting the physician in his diagnosis of thoracic diseases.

Dr Stokes noticed the existence of this sound in some cases of bronchitis in children, Dr Walshe has repeatedly observed it in infancy, and Dr Markham has elicited it in the case of an engorged lung, containing a certain amount of air, but without a cavity. But we are not aware that any attempt has yet been made to indicate, from the results of careful inquiry, the probable uses of this sign in practical medicine. It is very probable that it may subsequently be discovered in diseased conditions not yet observed by myself or others; but, among several which occur to me as very probable ones unnoticed for the present, I venture to give the following, as the results to which the present inquiry has led me, viz. :—

1st. That the cracked pot sound is far more frequent than is generally believed.

2d. That for its production, careful percussion, with the mouth open, should be practised with the hammer and pleximeter.

3d. That it is not necessarily indicative of a cavity in the lungs, but may be present in various diseases of the chest, and even when the chest is perfectly sound.

4th. That, notwithstanding, in percussing the chest, we should never omit to do so when the mouth of the patient is open, as well as shut, with a view of determining whether the cracked pot sound exists or not.

5th. If present, it indicates either healthy lungs, with very elastic thoracic walls, or else increased density mingled with confined or compressed air in the thorax.

6th. The youth of the patient, resonance on percussion, puerile or healthy respiration, and the absence of pulmonary symptoms, will serve to diagnose the healthy character of the lungs.

7th. If the usual signs and symptoms of pleurisy, with dulness, be present with the cracked pot sound, it indicates that a portion of spongy lung is still performing its functions, and is not far from the thoracic walls.

8th. If there be dulness under the clavicle with the mouth shut, and cracked pot sound when the mouth is open, it indicates a mixture of indurated tissue, and of air—a circumstance which may occur in partial pneumonia, or in phthisis pulmonalis—probably under other circumstances, such as aneurismal, or other tumours, compressing the lung.

9th. Partial pneumonia can only be distinguished from limited tubercular deposition under such circumstances, by the general symptoms on the one hand, and by the absence of signs of a cavity on the other. If these fail, the diagnosis is most difficult.

10th. But if there be symptoms and signs of a tubercular cavity, then the cracked pot sound indicates that such cavity has a direct communication with the larger bronchi, and through it with the external atmosphere.

11th. As this is the most common condition of tubercular cavities, the occurrence of the sound in such cases, though far from infallible, is still highly diagnostic.

The practical value of these conclusions, and the modifications in and extension of them, which may result from further clinical investigation, I shall not now dwell upon. It may be well to observe, however, that I have recently had a case in the clinical wards of the Royal Infirmary, where, with all the symptoms and signs of advanced phthisis, indicating small cavities at both apices, there was a remarkably loud percussion note over the left mammary region, with distinct metallic tinkling immediately under the nipple, at the close both of inspiration and expiration. The sound resembled a double *tink, tink*. It was supposed that pneumo-thorax existed, yet a careful *post-mortem* examination showed no formation of air, as supposed by Graves, no lesion of the pleura whatever, and no cavity where the noise was audible, but small nodules of tubercles scattered through emphysematous pulmonary tissue, with a small cavity at each apex. Was the metallic tinkling propagated downwards from

the cavity at the apex? This interesting question must for the present remain unanswered.

I have only, in conclusion, to express my conviction, that the remarkably characteristic cracked pot sound must be of greater importance than it has hitherto been considered, and that, if rightly interpreted, it is calculated to assist us, in an eminent degree, in rendering our diagnosis more complete and exact.

FINIS.



